September 2021

S146B Amendment to Mixed-use Development at Units 5A-C Second Avenue, Cookstown Industrial Estate, Tallaght, Dublin 24

Daylight and Sunlight Assessment Report

Applicant: Stranwil Ltd.

+353 (0) 1 288 0186
info@3ddesignbureau.com
www.3ddesignbureau.com

3D DESIGN BUREAU

Creative & Technical 3D Solutions in Design, Planning & Marketing.

Contents

1.0 Executive Summary

1.1 Summary of Assessment

3D Design Bureau were commissioned to carry out an ADF analysis to accompany a S146B amendment to the development previously approved under ABP-303803-19.

All rooms on the ground, first and second floor that are proposed to be changed or newly introduced as part of the amendment application have been analysed for ADF. This has been done to ensure that the altered units would comply with the daylighting and sunlighting Guidelines.

32 no. units have been assessed, which comprise of 68 no. habitable spaces.

Please see section 1.2 for a detailed breakdown of results.

1.2 Results Overview

Should the development be built as proposed, the following ADF values will be experienced.

Average Daylight Factor (ADF) of internal proposed development:

- Rooms assessed: 68 no.

With ADF target value of 2.0% applied to LKDs:

- Rooms meeting the guidelines: 65 no.
- Rooms not meeting the guidelines: 3 no.
- Amendment application compliance rate: ~96%

With ADF target value of 1.5% applied to LKDs:

- Rooms meeting the guidelines: 68 no.
- Rooms not meeting the guidelines: none
- Amendment application compliance rate: ~100%

2.0 Glossary

2.1 Terms and Definitions

Skylight
Non directional ambient light cast from the sky and environment.

Sunlight
Direct parallel rays of light emitted from the sun.

Daylight
Combined skylight and sunlight.

Overcast sky model
A completely overcast sky model, used for daylight calculation.

Existing Baseline Model State
The development site in its existing state. The proposed development has not been included. This model state has been used when generating the baseline results for all the existing neighbouring properties.

Proposed Development Model State
The proposed development has been modelled into the existing environment. This model state has been used when assessing the effect of the proposed development on the existing neighbouring properties, as well as assessments carried out within the proposed development itself.

Average Daylight Factor (ADF)
Ratio of total daylight flux incident on the working plane to the area of the working plane, expressed as a percentage of the outdoor illuminance on a horizontal plane due to an unobstructed overcast sky model.

Thus a 1% ADF would mean that the average indoor illuminance would be one hundredth the outdoor unobstructed illuminance.

Working plane
Horizontal, vertical or inclined plane in which a visual task lies. Normally the working plane may be taken to be horizontal, 850 mm above the floor in houses and factories, 700 mm above the floor in offices. The plane is offset 500 mm from the room boundaries.

BRE Target Value

When assessing the effect a proposed development would have on a neighbouring property, a target value will be applied. This applied target value is generated as per the criteria set out for each study in the BRE Guidelines.

Alternative Target Value
It could be appropriate to use alternative target values when conducting assessment of effect on existing properties. If such instances occur the rationale will be clearly explained and the instances where the alternative target values have been applied will be clearly identified.

Level of BRE Compliance
Each table in the study that has a column identified as "Level of BRE Compliance", identifies how an assessed instance performs in relation to the appropriate target value. If the instance is in compliance with the recommendations as made in the BRE Guidelines the value will be expressed as "BRE Compliant". If the instance does not meet the criteria as set out in the BRE Guidelines a percentage will be expressed to determine the level of compliance with the recommendation. This value determines the definition of effect.

2.2 Index of Tables

2.2.1 Average Daylight Factor

Below is an example of the table used to describe the daylight factor in proposed units.

Table No. 2.1: Example of ADF Results Table		
Unit Number	Room Description	Predicted ADF Value
A	**B**	**C**

A: Unit Number

This column identifies the assessed unit. All unit numbers are determined by the architect's drawings, unless otherwise stated.

B: Room Description

Room Description details which room of the unit has been assessed, e.g. bedroom, living room, etc.

C: Predicted ADF Value

The average daylight factor calculated for an assessed room.

3.0 Assessment Overview

3.1 Guidelines

In December of 2020 the Department of Housing, Planning and Local Government published a guidance document for new apartments, *Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities*. This document makes reference to the British Standard, *BS 8206-2:2008: Lighting for Buildings - Part 2: Code of Practice for Daylighting* (the British Standard) and to the Building Research Establishment's *Site Layout Planning for Daylight and Sunlight: a Guide to Good Practice* (the BRE Guidelines).

Prior to the publication of the apartment guidelines in December 2020 a European Standard had been published *EN 17037 Daylight in Buildings*. Furthermore, British authorities have published and adopted a national annex to the European standards, *BS EN 17037*. Neither *EN 17037* nor *BS EN 17.03* are referenced in the 2020 apartment guidelines and to the best of our knowledge is not referenced in any planning guidance document issued by Irish planning authorities. The BRE Guidelines have not been withdrawn. Until official guidance or instruction is published by a relevant authority on this matter, 3DDB will continue to reference the BRE Guidelines in our daylight and sunlight assessments.

Neither the British Standard, European Standard, British annex to the European standard nor the BRE Guide set out rigid standards or limits. The BRE Guide is preceded by the following very clear statement as to how the design advice contained therein should be used:

"The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design."

That the recommendations of the BRE Guide are not suitable for rigid application to all developments in all contexts, is of particular importance in the context of national and local policies for the consolidation and densification of urban areas or when assessing applications for highly constrained sites (e.g. lands in close proximity or immediately to the south of residential lands).

3.2 Average Daylight Factor (ADF)

The BRE Guidelines define the Average Daylight Factor as the average illuminance on the working plane in a room, divided by the illuminance on an unobstructed horizontal surface outdoors.

In housing, the working plane is considered to be 850 mm above the finished floor level and is offset 500 mm from the room boundaries.

BS 8206-2:2008 Code of Practice for Daylighting recommends an ADF of 5% for a well day lit space where no additional electric lighting is available, and 2% for a partly daylit space with supplementary electric lighting.

In terms of housing, *BS 8206-2:2008,* as referenced in the BRE Guidelines, also gives minimum values of ADF. These recommendations are considered to be the minimum value of ADF required for the following habitable spaces:

- 2% for kitchens;
- 1.5% for living rooms;
- 1% for bedrooms.

This study has assessed the Average Daylight Factor (ADF) received in all habitable rooms across the ground, first and second floors of the proposed development that are proposed to change with the amendment application.

Typically, ADF values increase in rooms located on higher floor levels, due to an improved relationship with adjacent obstructions. Where a room meets the guidelines for ADF, it can be reasonably assumed that similar rooms on subsequent floors will also meet the guidelines.

Note: non-habitable rooms and circulation spaces (e.g. bathrooms and corridors) do not require ADF assessment according to the BRE Guidelines.

For definition of spaces and target values applied, please see the methodology section of this report in section 4.0 on page 7.

The results for the study on ADF can be seen in section 6.1 on page 14.

4.0 Methodology

4.1 Building the Baseline and Proposed Models

In order to obtain the results of this assessments, 3D Design Bureau (3DDB) received a series of architectural 3D digital models using Revit 2021, a BIM software application made available by Autodesk.

Reddy A+U supplied 3DDB with a 3D model of the proposed development, which was subsequently prepared for daylight and sunlight analysis.

A combination of survey information, aerial photography, available online photography and/or ordnance survey information were used to model the surrounding context and assessed buildings. **Note:** as the information gathered from online sources is not as accurate as surveyed information, some tolerance should be allowed to the placement of windows, boundary treatments and the results generated. The surrounding structures and properties were consistent with the original application (ABP Reg. Ref. TA06S.303803).

Normally trees and shrubs do not need to be included in the studies carried out in this report, partly because their shapes are almost impossible to predict, and partly because the dappled shade of a tree is more pleasant than the deep shadow of a building (this applies especially to deciduous trees). Where a dense belt or group of evergreens is specifically planned as a windbreak or for privacy purposes, it is better to include their shadow in the calculation of shaded area. If and when trees have been included as part of the study, it will be clearly stated.

The proposed state used in the ADF analysis reflects the subject site if the development is built as proposed, including any changes as per the amendment application. This includes the demolishing of structures, landscaping etc. No trees were included.

4.2 Generating Results

The 3D models as stated above were brought into specialist software packages using state of the art daylight and sunlight analysis methods developed by 3DDB.

The results are generated and analysed considering the BRE Guidelines, as expanded on below.

4.2.1 ADF

Recommended Minimum ADF

The recommended minimum for Average Daylight Factor (ADF) is based on the function of the room being assessed.

The recommendations as per the BS 8206-2:2008 are as follows: 2% for kitchens; 1.5% for living rooms; and 1% for bedrooms. BS 8206-2:2008 also recommends that where a room serves more than one purpose, such as the modern day apartment design of the living/kitchen/dining (LKD) space, the minimum average daylight factor should be taken for the room with the highest value.

Notwithstanding this advice, an ADF target value of 1.5% should be considered appropriate for LKDs within this assessment. The rationale for this departure from the recommended minimum ADF of 2%, is in recognition that the primary function of LKDs within apartment developments is typically that of a living space. Should full compliance for the higher target value be sought, design changes could be needed, such as the removal of balconies or a reduction of unit sizes. Such mitigation measures could reduce the quality of living within the proposed units to a greater degree than the improvements that would be gained with increased ADF values. The appropriate ADF target value for LKDs is at the discretion of the planning authority, for which there is precedent in applying the 1.5%.

In new developments, some internal spaces (e.g. studio apartments, shared communal areas etc.) can possibly be of a nature that do not have a predefined target value in the *BS 8206-2:2008*. In such instances, 3DDB have applied a target value they deem to be appropriate.

Defining Areas

It is standard practice in apartment designs for LKDs to contain kitchens that are completely internal and not serviced by window on the external facade. These internal kitchens will often rely on supplementary electric lighting for periods of the day and can contribute to perceived lower ADF values in otherwise well-lit spaces. It should be noted that the LKD has been analylsed in its entirety, observing the preferred methodology that is currently accepted by planning authorities.

Circulation spaces, corridors, bathrooms etc. have not been assessed.

It should be noted that only the units that are to be altered as part of the amendment application have been analysed for ADF. Units that are consistent from the original application to the amendment application have not been studied, as they have been approved as part of the original application.

Indication of the assessed space in each room is provided in the floor plans that correspond to the ADF results in section “5.0 Results” on page 9.

Work Plane

The calculation of ADF is carried out on a hypothetical work plane which lies 850 mm from the finished floor level in residential units and 700 mm in academic and office spaces. The work plane is offset 500 mm from the room boundaries. Room boundaries are taken from the inside face of the interior walls and the centre line of any main external windows.

The Daylight Factor (DF) percentage has been calculated on the work plane across a series of points on a grid of approximately 100 mm.

The average of these figures determines the Average Daylight Factor (ADF).

Material Palette

The following values have been assumed for ADF calculations.

Table No. 4.1: Material Palette for ADF Calculations

Object	Material	Reflectance	Object	Material	Reflectance / Transmittance
Exterior walls	Standard Brick	0.3	Interior Walls	Off white paint	0.75
	Light Brick	0.4	Interior Ceiling	White paint	0.8
	Dark Brick	0.15	Interior Floor	Light timber	0.4
	Render	0.6	Miscellaneous	Miscellaneous	0.5
	Concrete	0.4	Glass	Double glazing	0.8
Ground cover	Paving	0.4		Maintenance Factor	0.91
	Tarmac	0.2		Glass adjusted for maintenance	0.73
	Grass	0.2		Frosted glass	0.5

5.0 Results

5.1 Average Daylight Factor

5.1.1 Ground Floor

Table No. 5.1: ADF Results Ground Floor		
Unit Number	Room Description	Predicted ADF Value
003	LKD	2.46%
003	Bedroom 1	2.58%
003	Bedroom 2	1.57%
048	LKD	2.77%
048	Bedroom 1	2.94%
048	Bedroom 2	2.83%
049	LKD	3.15%
049	Bedroom	1.18%
The following ADF target values should be considered when reading the above table of results: 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. For LKDs a target value of 2% or 1.5% can be appropriate. Consideration should be given to the methodology section of this report, specifically “Recommended Minimum ADF” on page 7, when reviewing these results.		

Figure 5.1: Floor plan of assessed building (L), Keyplan highlighting the assessed building (R).

5.1.2 First Floor

Table No. 5.2: ADF Results First Floor (Pt. 1)		
Unit Number	Room Description	Predicted ADF Value
008	LKD	2.65%
008	Bedroom	3.25%
010	LKD	1.76%
010	Bedroom	1.81%
055	Studio	5.18%
056	Studio	3.76%
057	LKD	3.00%
057	Bedroom	4.07%
071	LKD	3.20%
071	Bedroom 1	5.72%
071	Bedroom 2	1.48%
072	LKD	1.69%
072	Bedroom	1.81%
073	LKD	2.28%
073	Bedroom	2.20%
074	LKD	2.20%
074	Bedroom 1	1.63%
074	Bedroom 2	1.58%
The following ADF target values should be considered when reading the above table of results: 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. For LKDs a target value of 2% or 1.5% can be appropriate. Consideration should be given to the methodology section of this report, specifically “Recommended Minimum ADF” on page 7, when reviewing these results.		

Figure 5.2: Floor plan of assessed building (L), Keyplan highlighting the assessed building (R).

Table No. 5.3: ADF Results First Floor (Pt. 2)		
Unit Number	Room Description	Predicted ADF Value
060	LKD	2.90%
060	Bedroom 1	1.63%
060	Bedroom 2	3.96%
066	LKD	2.90%
066	Bedroom	3.12%
067	LKD	2.48%
067	Bedroom	2.96%
068	LKD	2.28%
068	Bedroom	1.50%
069	LKD	2.06%
069	Bedroom 1	2.11%
069	Bedroom 2	1.83%
070	LKD	4.15%
070	Bedroom 1	5.68%
070	Bedroom 2	1.88%
The following ADF target values should be considered when reading the above table of results: 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. For LKDs a target value of 2% or 1.5% can be appropriate. Consideration should be given to the methodology section of this report, specifically “Recommended Minimum ADF” on page 7, when reviewing these results.		

Figure 5.3: Floor plan of assessed building (L), Keyplan highlighting the assessed building (R).

5.1.3 Second Floor

Table No. 5.4: ADF Results Second Floor (Pt. 1)		
Unit Number	Room Description	Predicted ADF Value
015	LKD	2.91%
015	Bedroom	3.50%
016	LKD	2.88%
016	Bedroom	2.88%
079	Studio	5.51%
080	Studio	3.88%
081	LKD	3.15%
081	Bedroom	4.26%
097	LKD	3.34%
097	Bedroom 1	5.35%
097	Bedroom 2	1.57%
098	LKD	1.74%
098	Bedroom	1.37%
099	LKD	2.46%
099	Bedroom	2.31%
The following ADF target values should be considered when reading the above table of results: 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. For LKDs a target value of 2% or 1.5% can be appropriate. Consideration should be given to the methodology section of this report, specifically “Recommended Minimum ADF” on page 7, when reviewing these results.		

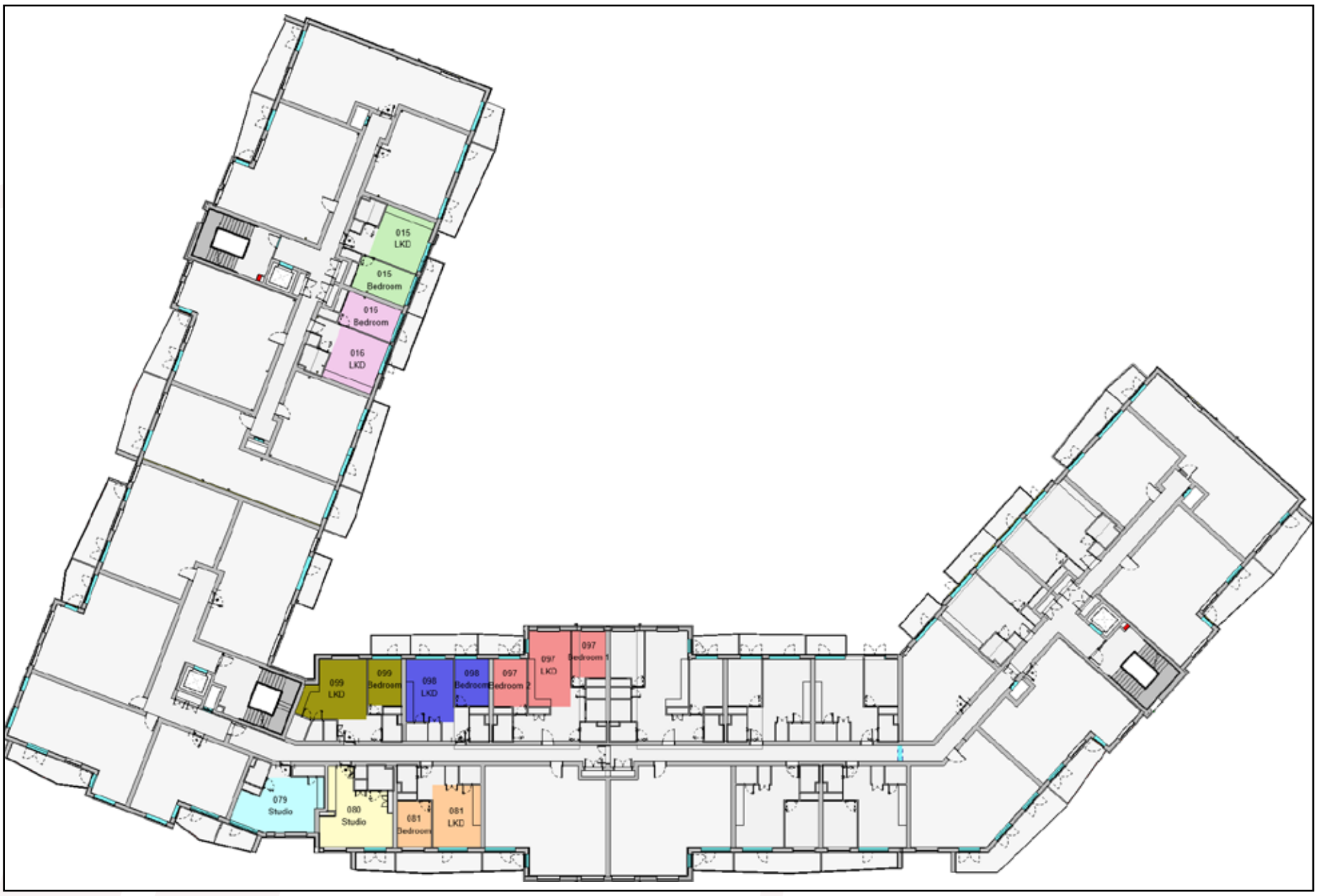

Figure 5.4: Floor plan of assessed building (L), Keyplan highlighting the assessed building (R).

Table No. 5.5: ADF Results Second Floor (Pt. 2)		
Unit Number	Room Description	Predicted ADF Value
084	LKD	2.73%
084	Bedroom	4.27%
085	LKD	2.82%
085	Bedroom	4.01%
091	LKD	3.07%
091	Bedroom	3.32%
092	LKD	2.63%
092	Bedroom	3.16%
094	LKD	2.43%
094	Bedroom	3.70%
095	LKD	2.44%
095	Bedroom	2.11%
096	LKD	4.29%
096	Bedroom 1	5.91%
096	Bedroom 2	2.14%
The following ADF target values should be considered when reading the above table of results: 2% for kitchens, 1.5% for living rooms and 1% for bedrooms. For LKDs a target value of 2% or 1.5% can be appropriate. Consideration should be given to the methodology section of this report, specifically “Recommended Minimum ADF” on page 7, when reviewing these results.		

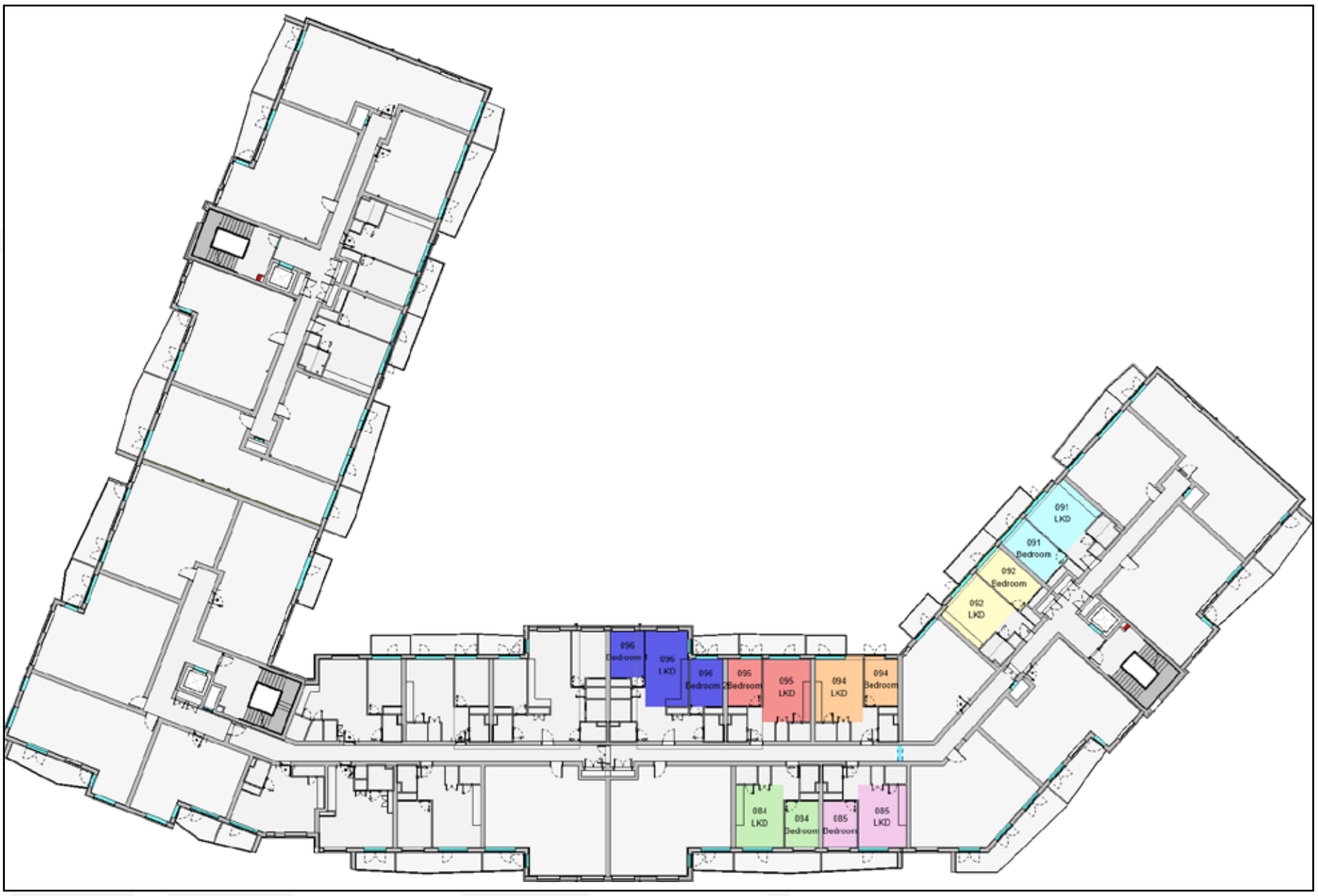

Figure 5.5: Floor plan of assessed building (L), Keyplan highlighting the assessed building (R).

6.0 Analysis of Results

Results were generated and analysed for the following studies:

- Average Daylight Factor
  - 68 no. spaces in the proposed amended development.

6.1 Average Daylight Factor (ADF)

This study has assessed the Average Daylight Factor (ADF) received in habitable rooms across the ground, first and second floor where the internal layout has changed for the amendment application.

It should be noted that the units that were granted as part of the original application have not been studied for the amendment application as they were considered to comply with the daylighting requirements at the time of submission.

If the appropriate target value for LKDs is considered to be 2%, the ADF value in 65 no. of the rooms meet or exceed their target values. This results in ~96% compliance of the rooms assessed for the amendment application.

If the appropriate target value for LKDs is considered to be 1.5%, the ADF value in all of the rooms meet or exceed their target values. This results in a 100% compliance of the rooms assessed for the amendment application.

Considering the design restrictions that are in place in relation to the amended and newly created apartments forming part of this S146B amendment application (the apartments being located within an established building footprint and block formation), 3DDB would consider these results to be favourable. They should be read in conjunction with the Planner's Report as well as the Design Statement, which will provide context for the proposed changes and the mitigation measures applied to ensure a high level of compliance across the scheme.

The complete results for the study on ADF can be seen in section 5.0 on page 9.

7.0 Conclusion

3D Design Bureau were commissioned to carry out an ADF analysis to accompany a S146B amendment to the development previously approved under ABP-303803-19

All rooms on the ground, first and second floor that are proposed to be changed or newly introduced as part of the amendment application have been analysed for ADF. 33 no. units have been assessed, which comprise of 68 no. habitable spaces.

If the appropriate target value for LKDs is considered to be 2%, the ADF value in 65 no. of the rooms meet or exceed their target values. If the appropriate target value for LKDs is considered to be 1.5%, the ADF value in all of the rooms meet or exceed their target values.

There is design restrictions in place for the altered units as they are part of an amendment application. Taking these constraints into account, the results can be considered to be positive. The Planner's Report and the Design Statement can provide context for the proposed changes, as well as the mitigation measures applied to ensure a high level of compliance across the amended scheme.